

IN THE CLAIMS:

Kindly amend claims 1, 3, 11-13, 15, 17, 18, 23 and 28-30, cancel claims 10, 14, 26, 27, and add claims 32-46, all without prejudice, as follows:

1. A plunger lift for a well producing through an above ground well head and a production string communicating with a hydrocarbon formation, comprising

a free piston having at least two sections, movable independently downwardly in the well, the sections being united at the bottom of the well for upward movement together in the well and having an exterior seal for pushing liquid, above the piston, upwardly, wherein the sections nest together during upward movement in the well;

the sections comprising an upper sleeve having a passage therethrough and a lower member lodging in the passage during upward movement in the well;

a separating rod for receiving the sleeve near an end of upward movement of the piston in the well and thereby dislodging the lower member from the sleeve for separating the piston sections adjacent the end of upward movement in the well, the separating rod having a lower end in the well head above ground level; and

a device for holding the sleeve in the well head above ground level.

3. The plunger lift of claim 2 wherein [a first of the sections comprises a sleeve having] the sleeve provides the seal thereon and further comprising a central passage therethrough and a second of the sections comprises a mandrel having a pin receivable in the sleeve during upward movement in the well.

11. The plunger lift of claim [10] 1 comprising means for releasing the [first section] sleeve from the [catcher] device.

12. A plunger lift for a well producing through a production string communicating with a hydrocarbon formation and through a well head above ground level providing a valve for closing the production string, comprising

a free piston having at least two sections, movable independently downwardly in the well, the sections being united at the bottom of the well for upward movement together in the well and having an exterior seal for pushing liquid, above the piston, upwardly, a first of the sections provides a first flow bypass around the first section allowing the first section to move downwardly in the well against the flow of formation products

upwardly in the well and a second section of the sections provides a restrictor for reducing the size of the first flow bypass when the first and second sections are united;

a decoupler, on the well head and above ground level, for separating the piston into separate sections in response to upward movement of the piston thereby allowing the sections to fall separately into the well, the decoupler being removable from the well head to provide a location where the piston sections jointly collect, the well head including a gas flow passage below the location so the piston sections may be removed from the well head after removing the decoupler and closing the valve; and

a device on the well head for holding a first of the sections and then releasing the first section in response to a signal.

13. A plunger lift for a well producing through a production string communicating with a hydrocarbon formation comprising

a free piston having at least [two sections] and upper section and a lower section, movable independently downwardly in the well, the sections being united at the bottom of the well for upward movement together in the well and having an exterior seal for pushing liquid, above the piston, upwardly; the ratio of surface area to weight of the lower section being greater than the ratio of surface area to weight of the upper section, the surface areas

being surface areas effective to move the sections upon the creation of a differential pressure thereacross; [and]

means for separating the sections adjacent an end of upward movement in the well; and

a device for holding the upper section adjacent the end of upward movement in the well for a time at least sufficient to allow the lower section to fall to the bottom of the well before the upper section reaches the bottom of the well.

15. A plunger lift for a well producing through a production string communicating with a hydrocarbon formation and through a well head above ground level, comprising

a free piston having at least upper and lower sections, movable independently downwardly in the well, the sections being united at the bottom of the well for upward movement together in the well and having an exterior seal for pushing liquid, above the piston, upwardly, the lower section being configured to move upwardly upon exposure to a predetermined pressure differential before the upper section moves,

a decoupler for separating the piston into separate sections at a location in the well head in response to upward movement of

the piston thereby allowing the sections to fall separately into the well,

a device for delaying downward movement of the upper section from the location during each cycle of movement of the upper section, the duration of the delay being sufficient to allow the lower section to reach a position adjacent the formation before the upper section reaches the position; and

a controller for varying duration of the delay.

17. In a plunger lift for lifting liquids from a well producing through a production string communicating with a hydrocarbon formation, comprising a piston having separate upper and lower sections movable independently downwardly into the well, each of the separate sections providing a downwardly facing cross-sectional area that is insufficient to move the section upwardly in response to gas flow emitting from the formation, the upper section having a first ratio of surface area to weight and the lower section having a second ratio of surface area to weight, the second ratio being higher than the first ratio, the surface area of the upper section being a surface area effective to move the upper section upon the creation of a differential pressure thereacross, the surface area of the lower section being a surface area effective to

move the lower section upon the creation of a differential pressure thereacross.

18. The plunger lift of claim 17 wherein [a first of the section is an upper section and a second of the sections is a lower section,] the lower section having more downwardly facing area than the upper section whereby a pressure differential across the united upper and lower sections produces a greater upper force on the lower section than on the upper sections if the sections move apart.

23. A method of lifting liquids from a well producing hydrocarbons from a formation with a plunger lift having a multipart piston, comprising dropping parts of the piston independently in the well, uniting the parts of the piston into a unit near the formation and moving the unit upwardly in the well in response to formation gasses passing into the well and thereby pushing liquid upwardly with the piston, wherein the dropping step comprises repeatedly dropping a first part of the piston into the well, pausing for a time period, then dropping a second part of the piston into the well and varying the time period between successive drops.

28. A plunger lift for a well producing through a production string communicating with a hydrocarbon formation, comprising

a free piston having at least first and second sections, movable independently downwardly in the well, the sections being united at the bottom of the well for upward movement together in the well and having an exterior seal for pushing liquid, above the piston, upwardly, the first section comprising a sleeve having means on the exterior of the sleeve for minimizing fluid bypass on the outside of the sleeve and a passage allowing formation contents to flow through the sleeve when the sleeve is falling into the well and the second section includes a restrictor for reducing flow through the passage when the sections unite at the bottom of the well;

a decoupler for separating the first and second sections at a location adjacent upward movement in the well and allowing a second section to fall into the well;

a device for holding the first section adjacent the location and, after a time period, dropping the first section into the well;
and

a controller for varying the time period.

29. A plunger lift for a well producing through a production string communicating between a hydrocarbon formation and a well head, comprising a free piston having at least first upper and -second

lower sections, movable independently downwardly in the well, the sections including means joining the sections together at the bottom of the well for upward movement together in the well and having an exterior seal for pushing liquid, above the piston, upwardly, the ratio of surface area to weight of the lower section being greater than the ratio of surface area to weight of the upper section.

30. The plunger lift of claim 29 wherein the well head [comprises] is above ground level and comprises a decoupler for separating the free piston into separate sections, the decoupler comprising a separating rod having a lower end in the well head above ground level.

32. The plunger lift of claim 29 wherein the surface areas are surface areas effective to move the upper and lower sections upon the creation of differential pressures across the upper and lower sections.

33. The plunger lift of claim 15 wherein the surface areas are surface areas effective to move the upper and lower sections upon the creation of differential pressures across the upper and lower sections.

34. The plunger lift of claim 13 wherein the well produces through a well head above ground level and the device, on the well head, holds the upper section above ground level.

35. The plunger lift of claim 13 wherein the device physically contacts the upper section.

36. The plunger lift of claim 13 wherein the upper section comprises a sleeve having a passage therethrough and the lower section nests in the passage during upward movement in the well and the separating means comprises a rod for receiving the sleeve near the end of upward movement of the piston and thereby dislodging the lower section from the upper section and wherein the device holds the sleeve in the well head above ground level.

37. The plunger lift of claim 33 wherein the sleeve comprises a recess on a side thereof and the device comprises a retractable detent for extending into the recess and thereby holding the sleeve.

38. The plunger lift of claim 1 wherein the well produces through a head providing a valve closing the production string, the decoupler being removable from adjacent the well head to provide a location where the piston sections jointly collect, the well head including a gas flow passage below the location so the piston sections remain united in response to the flow of gas through the well head whereby the joined piston sections may be removed from the well head after removing the decoupler and closing the valve.

39. The plunger lift of claim 1 wherein the well comprises a well head above ground level and the separating rod and device are located above ground level on the well head.

40. The plunger lift of claim 1 wherein the well head comprises a flow line opening into the well head above an uppermost position of the upper section, and a bypass conduit opening into the well head below the bottom of the upper section in its uppermost position, the bypass conduit being connected to the flow line.

41. The plunger lift of claim 12 wherein the well head comprises a flow line opening into the well head above an uppermost position of the upper section, and a bypass conduit opening into the well head below the bottom of the upper section in its uppermost position, the bypass conduit being connected to the flow line.

42. The plunger lift of claim 13 wherein the well head comprises a flow line opening into the well head above an uppermost position of the upper section, and a bypass conduit opening into the well head below the bottom of the upper section in its uppermost position, the bypass conduit being connected to the flow line.

43. The plunger lift of claim 15 wherein the well head comprises a flow line opening into the well head above an uppermost position of the upper section, and a bypass conduit opening into the well head below the bottom of the upper section in its uppermost position, the bypass conduit being connected to the flow line.

44. The plunger lift of claim 17 wherein the well head comprises a flow line opening into the well head above an uppermost position of the upper section, and a bypass conduit opening into the well head below the bottom of the upper section in its uppermost position, the bypass conduit being connected to the flow line.

45. The plunger lift of claim 28 wherein the well produces through a well head and the production string and the well head comprises a flow line opening into the well head above an uppermost position of the upper section, and a bypass conduit opening into the well head below the bottom of the upper section in its uppermost position, the bypass conduit being connected to the flow line.

46. The plunger lift of claim 29 wherein the well head comprises a flow line opening into the well head above an uppermost position of the upper section, and a bypass conduit opening into the well head below the bottom of the upper section in its uppermost position, the bypass conduit being connected to the flow line.